

BLOOD VESSELS

This account deals with our experience with the surgical treatment of dissecting aneurysms of the aorta and the use of homografts in this condition. As is known, this form of aneurysm is associated with a grave prognosis, having a rapidly fatal course in 75 to 90% of the cases, and up to now treatment has been largely symptomatic and unsatisfactory.

Pathologically, the lesion differs from other forms of aneurysm in its tendency to be diffuse rather than segmental in character, often extending throughout the extent of the aorta. It begins usually in the upper reaches of the aorta as a transverse tear in the intima and media just above the aortic valves or near the origin of the left subclavian artery, with separation of the intramural layers of the aorta by the forceful stream of blood. This dissection may then progress circumferentially to involve all, or a portion, of the aorta and distally down to the bifurcation, and even lower, to involve the femoral arteries. The extent and course of the dissection is quite variable and in most instances there is final terminal perforation through the outer wall, resulting in death in a few hours or days. In some cases, re-entry of the dissected passage into the true lumen takes place, usually at some point in the abdominal aorta, with the formation of a so-called "double-barrelled" aorta. This is nature's method of dealing with the problem and the patient may then survive for months or years.

It is thus apparent from these pathologic features of the disease that the principles of simple excisional therapy with homograft replacement, as used, for example, in fusiform aneurysms of the aorta, cannot be applied here in most instances. For this reason another approach to the problem is necessary. This was suggested to us by nature's method of healing, in which spontaneous re-entry of the dissected passage occurs, with

restoration of peripheral circulation. Accordingly, this constituted the basis for the principles underlying the procedure employed in our first case.

This patient, a white male 58 years of age, had experienced sudden, constricting pain in the chest approximately a year prior to admission and on radiologic examination of the chest was found to have a rounded density in the posterior inferior mediastinum that projected into the left hemithorax and appeared to be a markedly tortuous, dilated descending thoracic aorta. At operation, on July 7, 1954, the left pleural cavity having been entered through the bed of the resected fifth rib, there was revealed a U-shaped aneurysm of the descending thoracic aorta which projected posteriorly and to the left. The aorta above and below was elongated, tortuous and dilated, being more than twice normal size. After division of several pairs of intercostal arteries and mobilizing the aorta above and below the aneurysm, occluding clamps were applied proximal and distal to the U-shaped aneurysmal process, and the intervening segment was excised. Upon cutting across the distal end, there was revealed a double lumen formed by the dissecting process. The proximal end, however, showed only one lumen and on examination of the excised specimen it was apparent that the aorta had been divided above the origin of the dissecting aneurysm. The false lumen in the distal end was then obliterated by approximating the edges of the outer and inner walls with interrupted sutures (we have since used a continuous suture for this purpose). It was then possible to restore continuity by end-to-end anastomosis. Recovery was uneventful and the patient has since remained well. Subsequent angiocardiograms revealed a relatively normal outline of the descending thoracic aorta.

There were two unusual features in this case. The first was that the dissecting process began in the descending thoracic aorta and it was thus possible to remove it. The second unusual feature was that no homograft was needed to bridge the

defect, owing to the fact that it had become elongated, thus providing sufficient length, after it had been mobilized, to bring the ends together.

In subsequent and more typical cases, the origin of the dissecting process was found to have taken place in the region of the aortic arch. Under these circumstances the descending thoracic aorta is mobilized and cross-clamped in a similar manner and then divided between the clamps. The false passage in the lower end is also obliterated in a similar fashion by approximating the outer and inner layers. The proximal end, however, is managed somewhat differently, since the purpose here is to create an opening between the outer and inner lumens for the flow of blood from the dissecting false passage into the true lumen. Accordingly, a wedge shaped segment is excised from the inner wall and the two ends of the aorta are approximated by end-to-end anastomosis. Thus, blood from the double aortic lumen above is diverted into the single normal lumen below. Although this obviously does not cure the dissecting aneurysm in the region of the aortic arch, it is believed to have the following beneficial effects. First, by shortening the extent of the false passage there is a tendency to reduce peripheral resistance to blood flow and thus diminish the danger of rupture of the weakened outer wall; second, by restoring blood flow into the normal aortic lumen in the abdominal aorta there is a tendency to correct the compressive ischemic effects of the false passage upon the points of origin of the major vascular channels arising from the aorta.

In still other forms of the disease the dissecting process may be associated with a fairly

well localized fusiform or sacciform arising in the outer wall. Under these circumstances it would seem desirable to combine the principles used above with those of excision and replacement of the defect with a homograft. This form of treatment was employed in two of our cases. The aneurysm in these cases arose near the origin of the subclavian artery and, while the dissecting process extended down into the abdominal aorta, there was a fairly well localized fusiform aneurysm involving the outer wall in the distal part of the aortic arch. The procedure employed here consisted in cross-clamping the aorta at the level of the subclavian artery proximally, and just below the fusiform dilatation distally, excising the intervening segment, obliterating the distal false passage by approximating with suture the inner and outer walls, and restoring aortic continuity with a homograft. Hypothermia is employed in these cases where temporary arrest of aortic circulation must be done at such a high level in order to prevent ischemic damage to the spinal cord.

Our experience with these methods of treatment includes 6 cases, with 2 deaths, one of which occurred on the eighth post-operative day from rupture into the pericardium, presumably from uncontrollable hypertension, and the other from ventricular fibrillation, probably as a consequence of tension pneumothorax and hypothermia. The results in the 4 patients who recovered have been quite gratifying.

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